AIRCRAFT EQUIPMENT DIVISION

JPR-152
February 6, 1979

NASA CR-
160234

# REPORT

## SOLID POLYMER ELECTROLYTE

## WATER ELECTROLYSIS

## PREPROTOTYPE SUBSYSTEM



Contract No. NAS-9-14205

Data Item No. 4

FINAL REPORT

Prepared for:

National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058


DIRECT ENERGY CONVERSION PROGRAMS
50 FORDHAM ROAD
WILMINGTON, MASSACHUSETTS 01887

GENERAL ELECTRIC

through various components, activates a logic circuit which determines a rotating or non-rotating signal. A non-rotating signal causes the logic circuit to open a solenoid valve allowing the gas in the core to be vented. Since the separator is operated at a pressure higher than the discharge point, gas is forced out of the separator. This causes the gas core to shrink, and the spinning liquid engages the sensor impeller, causing the logic curcuit to close the solenoid valve. More gas enters, is separated, the gas core grows until the sensor impeller slows, the vent valve is opened, the core shrinks, the sensor impeller rotates, and the valve closes. Repeated cycling of the solenoid valve with an interrupted flow of hydrogen gas is prevented by the operation of the hydrogen differential pressure regulator, which controls pump differential and the corresponding core diameter of the spinning water annulus. A cross-section of the differential regulator is provided in Figure 29 of Section 5.3.

A schematic representation of the combined phase separator-pump and hydrogen differential pressure regulator is shown in Figure 1 (Appendix). The hydrogen differential pressure regulating valve is shown with a metal bellows, spring (with adjustable load and pressure differential) and poppet. The inside of the bellows is referenced to water outlet pressure of the pump. Hydrogen admitted to the valve builds up pressure until the force balance of the spring and bellows pressure differential (normally $PH_2O - P_{H_2} = 69\ KN/M^2$ (10 psid))compresses the bellows and opens the poppet to release hydrogen at the controlled differential setting. This setting is equal to a pump pressure rise such that the core diameter is slightly greater than the core sensing impeller which stops rotating and signals the solenoid valve to remain open.

The control range of the pressure regulator maintains a sufficient pump head for water circulation and a gas core radius greater than pickup impeller during all system operating modes and gas generation rates. The phase separator control logic remains unaffected such that the solenoid valve closes momentarily during system pressure transients, and remains closed at shutdown. During system startup, the solenoid valve may cycle two or three times before a steady state core radius is established.

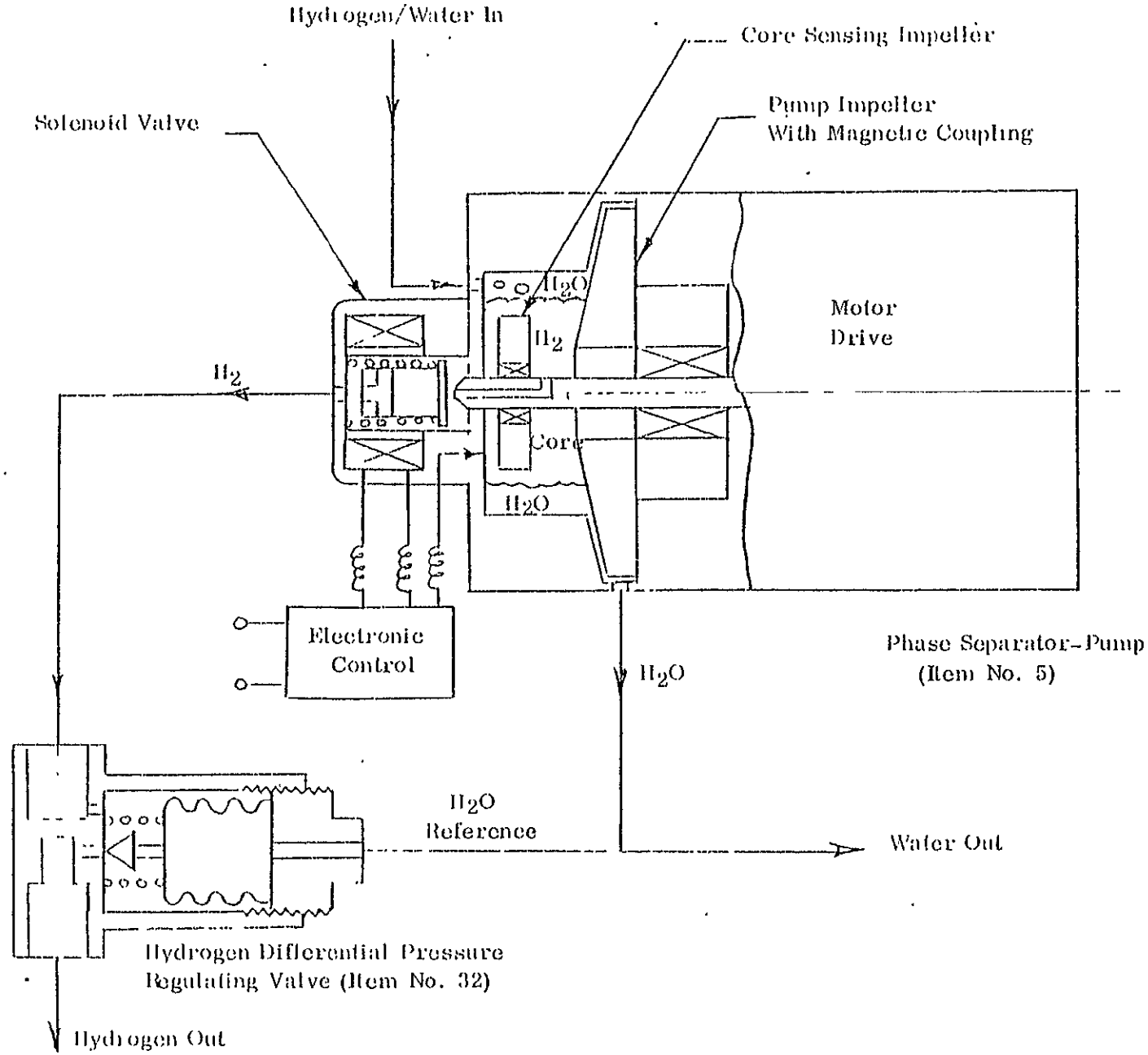


**Figure 1. Appendix**

Schematic of Combined Phase Separator-Pump and $\Delta P$ Regulator